

MEMORANDUM

Date: 06/19/2019

SUBJECT: Review Comments on the Draft Remedial Investigation Report. Homestake Mining Company Superfund Site. June 21, 2016.

FROM: Ghassan A. Khoury, MSPH, Sc.D.
Site and Risk Assessment Section (6SF-TR)

TO: Mark Purcell, RPM
LA/NM/OK Remedial Section (6SF-RL)

I reviewed the Risk Assessment part of the Draft Remedial Investigation Report. Homestake Mining Company Superfund Site and the following are my comments:

General Comments:

1. The reasonably anticipated future land use for the Homestake Superfund site was assumed to be commercial/industrial land use in the baseline risk assessment. Since change in land use could impact remedial action objectives for the site, institutional control is used to restrict future uses. Therefore, a remedy such as Institutional controls to limit future exposure, will be required to protect human health and the environment. A deed restriction is needed that prohibits residential and agricultural use of the LTAs and use of the groundwater beneath the LTAs for drinking purposes.
2. EPA radon mitigation level of 4 pCi/L for indoor air should not be used as a background or screening tool to downplay the risk associated with this level. In addition, it should not be compared to outdoor radon air levels at the facility or at the LTAs for any exposure scenario.
3. Indoor radon levels at the facility was reported to be at 4,521 pCi/m³. This level is higher than the EPA's radon mitigation action level of 4,000 pCi/m³. Are there any radon mitigation efforts planned for the facility? What safety measures are taken by employees at the facility to alleviate their continuous exposure to radon.
4. There are no sediment samples collected from the bottom of the collection/evaporation ponds. Sediment samples need to be collected to fill this site characterization data gap. If as reported, that there is no lab that will accept sediment samples with high radioactivity, then this need to be documented in the RI report.

Specific Comments:

1. Page 5-4, 1st paragraph

- It is reported that “Currently, a deed restriction is in place that prohibits residential and agricultural use of the LTAs and use of groundwater beneath the LTAs for drinking water purposes. Refer to Appendix K for a copy of the recorded deed restriction.

A copy of the deed restriction was not provided. Please provide the deed restriction in Appendix K.

2. Page 5-4 Section 5.2.1.4, 2nd paragraph

- COPCs and ROPCs released from the tailings could be transported by surface water runoff to other areas down gradient from the source.

It was not clear and was not mentioned how contamination transported by surface water runoff will be addressed. Please add a sentence to specify that surface soil concentration collected downgradient from the tailing piles should also reflect contamination transported by surface water in addition to contamination transported by air. This information is provided in the CSM but need to be explained in the write up in the potential contaminants’ migration routes.

3. Page 5-5 2nd paragraph last sentence

- In addition, groundwater remedies approved and monitored by EPA will remove contamination from groundwater at the LTAs. Therefore, food chain contamination due to contaminated irrigation water or alluvial groundwater will not be further addressed in this HHRA.

This sentence implies that groundwater remedies will remove contamination from groundwater at health-based numbers. Groundwater remedies are currently set at non-health-based levels. Please add a sentence to clarify that the remedies will remove contamination to site specific background levels which could be at levels higher than the MCL value of these chemicals or radionuclides.

Please also add that the food chain contamination will not be further addressed in this HHRA because the deed restriction will also prohibit animal grazing on this land or using the land to grow food for animal or human consumption.

4. Page 5-6, 2nd bullet

- Evaporation Pond Sludge – An accidental immersion into the brine or sludge surrounding the ponds was also considered a possibility. However, review of EPA data indicated many constituents were lower in sludge than in surface soils, likely because the ponds contain relatively clean water that has been treated in the RO unit (EPA 2014a). If included in an exposure model, part of the typical total allotted soil ingestion rate would have to be reallocated to this brine/sludge material, which would then reduce predicted soil exposure. Given that the areal extent of the brine/sludge is

very small relative to the soil areal extent and that humans would rarely contact it; it was not included in the quantitative evaluation.

The definition of “Pond Sludge” should be solids at the bottom of the Evaporation Ponds and not surrounding the ponds. EPA referred to the white solids surrounding the ponds as “white residues” and not sludge. EPA sampled the white residues due to complaints received from the residents living next to the HMC facility claiming seeing white residues on their cars, plants and porches. Sludge at the bottom of the ponds were not tested and there is no data characterizing the sludges. This is a data gap identified and should be sampled for proper characterization of waste generated at the site and included in the Remedial Investigation/ Feasibility Study equivalency report. If the waste is considered radioactive and there are no labs that accept samples from such a waste, it should be recorded as such and addressed in the Feasibility Study.

5. Page 5-6, 3rd bullet

- Groundwater –Groundwater is not an exposure medium for the HHRA. Groundwater is encountered at a depth of roughly 40 ft bgs and is undergoing remediation. Groundwater that passes through the reverse osmosis system may enter the evaporation ponds, at which point any exposure is addressed as pond water. Section 5.2.5.2.7 discusses post-remediation groundwater exposure.

This statement refers to the current use of groundwater. However, for future land use, groundwater should be evaluated as a complete exposure pathway for future indoor worker. Groundwater at the remediation levels can be used for this evaluation. Unless groundwater is deemed not useable based on groundwater classification. The National Contingency Plan (NCP) requires that all water should be returned to its potential beneficial use unless it is technically impracticable to do so.

6. Page 5-8 Table 5-2

The site-specific exposure conceptual site model (CSM) does not evaluate risk from exposure to groundwater for future composite worker. Need to add this pathway in the CSM.

7. Page 5-10 Section 5.2.2.1.1

- EPA RSLs (EPA 2015a) for the composite worker exposed to industrial soil were used as the screening levels for metals for identifying COPCs (EPA 2015a).

Need to recheck with updated EPA RSLs to make sure that the numbers used have not changed.

8. Page 5-11 Table 5-4

- The whole table needs to be revised and updated with the new values provided both in the Regional Screening Level for chemicals and EPA Radiation PRG Calculator for radionuclides.

Uranium RSL soluble salt was reported to be 350 mg/Kg for composite worker associated with a HI =0.1

The April 2019 version of the RSL reports 23 mg/Kg as the composite worker screening level. Please review and adjust accordingly.

The secular equilibrium PRG for Ra-226 is 2.03E-02 pCi/g, For U-238 is 2E-02 pCi/g etc...

Please review the whole table and update with new values.

9. Page 5-13 Section 5.2.2.2

- Screening values for radionuclides (RadPRGs) were obtained from the EPA-Oak Ridge National Laboratory (ORNL). Screening values included daughter products (progeny) indicated by +D, where available.

The New PRG calculator does not provide screening values including its progeny as indicated by +D. Please use the new calculator assuming secular equilibrium.

10. Page 5-14 Table 5-5 and Table 5-6

Please review these tables to conform with the new updated values.

11. Page 5-16, 2nd paragraph

- One identified uncertainty in the screening analysis is associated with data for molybdenum and selenium analyzed by HMC contract laboratories where the RLs were elevated compared to RLs from EPA's laboratories. However, the number of detected values associated with the EPA 2011 data suggests that selenium and molybdenum concentrations are not elevated across the Site, and both metals were screened out as potential COPCs (Table 5-8).

Since selenium and molybdenum are contaminants associated with Homestake site activities, it is recommended to keep those chemicals as COC.

12. Page 5-17 Table 5-7

Please review these tables to conform with the new updated values.

13. Page 5-20 Section 5.2.3

Selection of chemical and radionuclides (ROC) of concern needs to be reevaluated based on the updated screening levels. U-234 seems to be screened out from soil ROC. Please revise.

14. Page 5-25 Section 5.2.3.3.3

- This receptor is assumed an older adolescent or young adult and represents an adult or older juvenile who walks their dog, rides a mountain bike or dirt bike, or otherwise uses the Homestake Facility or LTAs for infrequent recreational purposes.....The PEF of 6.61×10^9 for both COPCs and ROPCs was based on the EPA (2015a; 2014b) calculators for Albuquerque, NM.

The PEF value used here is for emission of particulate due to wind generation. For activities such as rides a mountain bike or dirt bike, emission is expected to be much higher. If riding a dirt bike is a potential for such land uses, then particulate emission due to such activities need to be developed and risk evaluated.

15. Page 5-27, 2nd paragraph

- Ra-222 was measured in outdoor air from the Homestake Facility and at the fenceline, which was used as the EPC for the LTAs and Homestake Facility....Ra-222 was measured, and in indoor air from buildings on the Homestake Facility.

Please replace Ra-222 with Rn-222 to denote radon gas.

16. Page 5-27, 1st bullet

- To use the U-nat data as metal data, it was converted to units of mg/kg by multiplying by its activity of 677 pCi/mg.

Do you multiply, or do you divide by its activity of 677 pCi/mg? Please review and indicate where this conversion was used.

17. Page 5-27 last sentence

- Volatile chemicals such as radon (Rn-222) that behave according to Henry's Law can emanate from water or soil into air and can then be inhaled. Shower models were considered too conservative for prediction of outdoor air exposure due to emissions of radon from the ponds. This pathway is addressed in the uncertainty analysis because radon in water data were not available.

Outdoor radon measurements collected by EPA and by HMC should capture outdoor radon emitted from different onsite sources including background sources. These measurements can be used to evaluate risk from inhalation of radon emitted from different onsite sources.

18. Page 5-33 Table 5-14

The RfD for Uranium (soluble salt) was given as 3E-03 mg/kg-day. The RfD is reported as 2E-04 mg/kg/day in the EPA regional screening level table. Please verify that all toxicity values did not change from the June 2016 RI report.

19. Page 5-38 Section 5.2.5.1.2, 1st bullet

- A receptor with both surface soil and subsurface soil exposure would have doubled exposure if risks were directly summed. For total risks, where surface and subsurface soil were both evaluated, as in the case for the adult construction worker, the sum of the individual exposure pathway cancer risks was divided by 2.

Exposure to surface soil and subsurface soil is usually evaluated by combining soil data from both areas to come up with one EPC that represent exposure to both media. Do not divide risks by 2.

20. Page 5-39, 1st paragraph

- The construction worker is modeled as exposed to both outdoor and trench air. This receptor would have double exposure if both media were counted at 8 hours per day, resulting in a 16-hour daily exposure. The construction worker is exposed to soils 8 hours per day for external exposure and ET is therefore not adjusted in the model; the individual pathway exposures reflect 8 hours exposure, where for dose calculations, ET is 8 hours, and the total exposure (sum of the air and sum of the soil exposure pathways) are each divided by 2 to estimate total exposure.

Same as comment No. 17. If same media (air) then you can combine data from outdoor air and trench air and develop an EPC for air, but do not divide risk by two.

21. Page 40 Section 5.2.5.1.4, 3rd paragraph

- Molybdenum concentrations at the Site greatly exceeded background (factor of 45) (Table 5-18); however, most concentrations of COPCs and ROPCs were similar to, or lower than, background in the LTAs. This suggests Site-related activities have not significantly impacted surface soils.

Please remove the last sentence since site activities have largely impacted onsite soil by a factor of 45.

22. Page 40 Section 5.2.5.1.4, 4th paragraph last sentence.

- The radon UCL95 for all data from within the Homestake Facility and LTAs was 1.4 times higher than background. Therefore, although the Homestake Facility does appear to be contributing radon above background levels, the additional amount is low.

Homestake facility and LTAs are considered two separate exposure units. It was not clear if the two locations are evaluated as one exposure area. Please clarify.

23. Page 41 Last Paragraph

- Background values were not available for indoor air or trench air. A value of 4 pCi/L (4000 pCi/m³) is the standard radon mitigation level for indoor air. Above this level, EPA recommends remediation. This level was applied as a proxy for measured background in the area and used to estimate background levels of exposure to trench and indoor air for comparison to Site exposure estimates.

As stated the 4 pCi/L is a radon mitigation level for indoor air. It cannot be used as a background level for trench air. Outdoor air radon levels at HMC # 16 should be used instead as a background level. Please note use the 40 CFR Part 192.02(b)(2) as a standard for radon-222 acceptable outdoor air level. The standard states: (2) Increase the annual average concentration of radon-222 in air at or above any location outside the disposal site by more than one-half picocurie per liter.

24. Page 45 Section 5.2.5.2, 1st bullet last sentence

....and 4,000 pCi/m³ (the level above which EPA recommends mitigation for indoor air) was used as a background value for indoor air to represent any buildings within the Site.

The 4,000 pCi/m³ is an action level and should not be used as a background level. EPA in its risk assessment for offsite residential area (EPA 2014) found that the 95% UCL background indoor radon levels (28 houses in Bluewater Village) is about 2.0 pCi/L. Please use this level as a background level for indoor air.

25. Page 45 Section 5.2.5.2, 2nd bullet

- For the construction worker, the inherent background radon risk is calculated as the sum of the trench and outdoor air pathways (where each pathway was modeled as an eight hour exposure to account for a worker that is predominantly in a trench all day) divided by 2, which equates to 4 hours outdoors and 4 hours in a trench, with 1304 pCi/m³ used as the EPC for outdoor air and 1570 pCi/m³ from the EPA air monitoring data collected 6 inches above ground surface (EPA 2014a) used to represent hypothetical background for trench air.

It was not clear where the site concentration of radon of 1304 pCi/m³ came from. Outdoor air concentration of 1570 pCi/m³ represent the 95% UCL result of air samplers placed at the fence line 6" above ground between Homestake facility and the residential neighborhood. These levels are therefore not outdoor background levels. The outdoor background levels for radon gas is the one measured at HMC-16 monitoring station. Please use radon levels measured at HMC-16 as outdoor background levels.

26. Page 5-46 Section 5.2.5.2.1 2nd paragraph

- The major contributor to risk is due to radon inhalation. Note that radon is, however, only slightly elevated above background for outdoor air (site concentration is 1304 pCi/m³ and background is 957.3 pCi/m³), and the Site indoor air concentration of 4521 pCi/m³ is only slightly higher than the indoor air mitigation level of 4 pCi/L (4000 pCi/m³).

Please refrain from using the word “only” slightly higher. The site indoor air concentration of 4521 pCi/m³ is extremely high and an immediate action need to be taken to reduce the air concentration. The 4 pCi/L is an EPA mitigation action level. Which means a mitigation action needs to be taken to alleviate the risk to exposed workers. According to EPA Radon Citizen’s Guide the excess lung cancer risk for an individual exposed to 4 pCi/L and is a smoker is about 62 per 1000 individuals.

27. Page 5-47, 2nd paragraph last sentence

- All measured radon concentrations in air in the Homestake Facility (range of 0.76 to 2.36 pCi/L or 760 to 2360 pCi/m³) fall well below the indoor guideline for radon mitigation of 4 pCi/L (4000 pCi/m³).

It was not clear if the range of radon concentration is for indoor air or outdoor air. It was previously reported that the Site indoor air concentration was 4521 pCi/m³. If the range is for outdoor air, then it should not be compared to the EPA radon mitigation action level of 4 pCi/L.

28. Page 5-47, last sentence

- It is assumed that best construction practices would be utilized in the event there are any buildings constructed within the LTA boundaries, which would reduce radon exposure further.

Please remove this sentence from the document. The baseline risk assessment is done for the site as is, without any remedial action or best construction practices taken.

29. Page 5-48 Section 5.2.5.2.5, 3rd paragraph, 2nd sentence.

- This is estimated as the sum of the surface soil pathways at exposure times of 8 hours per day and soil ingestion rates of 330 mg/d plus the sum of the air pathways calculated for an 8 hour day divided by 2 to avoid double counting air exposure.

As mentioned above in previous comments, do not divide risk by 2 but can combine data.

30. Page 5-49 Section 5.2.5.2.6, 2nd paragraph

- All measured radon concentrations in air in the LTAs (range of 540 to 2360 pCi/m³) fall well below the indoor guideline for mitigation of radon exposure of 4 pCi/L.

Please do not compare outdoor air radon levels with indoor radon mitigation action level. Outdoor radon EPC could be calculated and compared with outdoor HMC-16 background levels. The increase of risk then can be determined.

31. Page 5-51 Table 5-21

- Uranium levels in surface soil was reported as NA, Not a chemical of concern.

Please review since uranium is a site related contaminant, it should be included in the risk assessment. If uranium concentration as a metal for surface soil in mg/Kg is not available, use the conversion factor of 677pCi/mg to convert uranium activity in surface soil to uranium metal concentration.

32. Page 5-52 Table 5-22 Footnote 2

- EPA's indoor air radon action level of 4 pCi/L was used as a background level for air radon levels in trenches for a construction worker.

Please do not use EPA's indoor air action level as a background air level.

33. Page 5-53 Table 5-23 Footnote 1

- It was reported that "To avoid double counting exposure, total risk is calculated as (sum of the surface and subsurface soil pathways based on 330 mg/d soil intake) divided by 2"

Please do not divide risk by two. Combine data for surface and subsurface soil to calculate the exposure point concentration instead.

34. Page 5-64 Section 5.2.5.2.7 Potential Risk Estimates for Post-Remedy Groundwater.

- Risk was estimated for Ra-226 and Ra-228 at their MCL values.

There is no need to evaluate risk for chemicals of concern or radionuclides of concern at their MCL value. The National Contingency Plan (NCP) set expectations that EPA restore groundwater to its beneficial uses wherever practicable. Response actions to attain MCL values are usually considered in groundwater restoration to drinking water standards. EPA's groundwater strategy does not rely on potential land use but on groundwater potential beneficial use classification (i.e. whether it is Class I, Class II or Class III groundwater). However, for Homestake site, cleanup level for groundwater was set at high anthropogenic background levels for selenium and uranium of 0.32 mg/L and 0.16 mg/L respectively. These levels are approximately 5 times higher than the MCL for uranium and about 6 times higher than the MCL value for selenium. Therefore, risk associated with the use of potable water containing high background level of uranium and selenium need to be evaluated quantitatively in the

risk assessment. This is important for the project manager to take appropriate actions should the risk of the high background cleanup level still present unacceptable risk. In this case institutional control to restrict access to the aquifer or treatment at well-head may be considered in the feasibility study.

35. Page 5-67 Section 5.2.6 Conclusions

- It is reported "That the LTAs do not present an elevated risk to human health under the assumptions in this report is further supported by the soil EPCs being less than or similar to background, but also by the fact that the measured air data were well below the 4 pCi/L threshold established as a benchmark for mitigation of indoor air."

Please remove the reference to 4 pCi/L as an acceptable threshold value. The 4 pCi/L is EPA's mitigation action level and not a health-based level.

- Please indicate in the conclusion section that the risk from inhalation of indoor radon gas at 4,521 pCi/m³ is unacceptable and requires immediate attention.
- Please indicate in the conclusion section that for the future composite worker the excess cancer risk attributable to the site was estimated at 2E-03 (Table 5-20) which is above the EPA's generally accepted upper end of the cancer risk range of 1E-04.
- Please indicate in the conclusion section that the risk for construction worker at the Homestake facility from inhalation of trench air is higher than the inhalation of radon gas at the background ambient air concentration. Provide the risk associated with inhalation of trench air without comparing it to the indoor air EPA mitigation level of 4,000 pCi/m³ (Table 5-22).